

The columns of Matted Triggers are very sensitive earlier in the morning and later in the evening than in other species. They also respond on wet, dull days. They can re-poise within four minutes but are not fully sensitive again until the lapse of about an hour and a half. Sometimes they will respond within twenty minutes with a feeble movement that rarely raises the trigger past the top of the arc (see Fig. 6 of plate). These longer periods of sensitivity, the great variety of numerous visitors and the vast numbers of flowers would *appear* to ensure the successful production of large quantities of seed. This is not so. Very few seed capsules mature. This may be the result of the indiscriminating stances of the smaller insects. It is certain that the bigger insects are useless for the flowers' purpose—the flying columns are too short to strike these visitors as they sip hovering in front of the flowers. This wastes sensitivity. The small insects rarely stand correctly aligned. They have merely to crawl from bloom to bloom so closely are they set. The triggers hit them in many places and the uncertain scattering of pollen is wasteful. So the plants have need of their surer method of propagation by creeping stems when fertilisation of ovules is chancey.

Each plant grows new stems which root and in their turn grow new stems which can function as independent plants. The process continues until a colony of interwoven plants develops in which it is impossible to tell where one begins or ends. When such a colony covers acres of ground its age is not to be guessed at.

A NEW SHARK FROM NORTH-WESTERN AUSTRALIA

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A Whaler shark, closely allied to a Javanese species, was recently obtained in north-western Australia and the Northern Territory during cruises of the fisheries research vessel *Stanley Fowler* under charter to the C.S.I.R.O. It enters the genus *Galeolamna* (as restricted in *Austr. Zool.*, vol. xi, 1945, p.1) but differs from the genotype (*G. greyi* Owen) in having a more pointed snout and more deeply notched teeth. The holotype female, 154 cm. long, was gravid and probably primiparous, and was the largest of numerous living specimens examined by the author. Diagnostic characters are the 25 to 31 teeth in either jaw (usually 14 or 15 each side of symphysial tooth), small second dorsal fin, gothic-arched snout, no interdorsal ridge, and it usually has dark tips to some fins and a dark diffuse lateral band.

Genus *GALEOLAMNA* Owen 1853.

Galeolamna pleurotaenia tilstoni, subsp. nov.

(Figs. 1-2)

Carcharias (Prionodon) pleurotaenia Bleeker, *Verh. Bat. Gen.*, xxiv., 1852, Plagiost., pp. 7, 9, 28 and 40, pl. ii., fig. 6. Batavia, East Indies.

Carcharias pleurotaenia Jordan and Seale, *Bull. U.S. Bur. Fish.*, xxv, 1906, p. 182. New Guinea [error for Batavia], East Indies. *Ex* Bleeker.

Eulamia (Platyodon) pleurotaenia Fowler, *Bull. U.S. Nat. Mus.* 100, xiii, 1940, pp. 150 and 166, fig. 8. (*q.v.* for refs.).

Head acutely pointed, gothic-arched from above; predorsal profile not gibbous. Eyes moderate, circular, with nictitating membrane; pupil a vertical slit. Interorbital broadly convex. Anterior margin of eye a little posterior to front of mouth.

Head 4.1 in total length. Preoral length less than width of mouth. Snout, in front of line connecting outer ends of nostrils, less than half as long as distance between inner ends of nostrils.

	15.1.15	31
No spiracles. Dental formula	— —	= —
	14.1.1.14	30

Teeth erect, compressed, broader in upper than in lower jaw; points deflected outwards in upper jaw, inwards in lower. Teeth of both jaws notched on both sides. In the upper jaw the teeth are strongly serrated on their shoulders, more finely serrated on sides of cusps, and entire distally. In the lower jaw the shoulders are not serrated, the sides of the cusps are very finely serrated and the tips are entire. One to three series of small symphyseal teeth in upper jaw; two larger, erect and pointed teeth, one on each side of symphysis, in lower jaw, these smaller than adjacent lateral teeth.

Nostrils nearer mouth than end of snout. Nasal flap small. Upper labial fold longer than lower. Endolymphatic openings inconspicuous. First gill-opening more than two-thirds internarial.

Body robust. Lateral line indistinct. No interdorsal ridge. No keel on caudal peduncle which has a lunate pit above and below. Pit organs small and numerous. Umbilical scar obsolescent. Shagreen: denticles imbricate, with five keels reaching edge of each one but not produced beyond margin as spines.



Fig. 1.—Tilston's Shark, *Galeolamna pleurotaenia tilstoni*, Whitley, Holotype from Van Cloon Shoal, Western Australia. Above: lateral view of whole shark. Below (left to right): lower surface of head, nostril, tooth from upper jaw, tooth from lower jaw and dermal denticles.

Biometric measurements, following the scheme propounded in *Proc. Linn. Soc. N.S.Wales*, vol. lxviii, 1943, p. 114, were as follows:

Measurement	Holotype Female	Paratype A Female	Paratype C Male	Paratype F Male
H.1	307 mm.	267	284	160
2	372	333	355	187
3	121	113	124	75
4	134	116	150	85
5	372	328	346	180
6	810	652	687	375
7	20	19	24	16
8	22	20	24	15
9	139	121	152	86
10	No Spir.	.....	.....	.....
11	19	18	22	15
12	78	69	85	50
13	110	100	102	64
14	135	107	138	65
15	10	5	6	1.5
16	3	3	4	3
17	65	48	46	20
18	51	38	52	20
B.1	1110	900	1040	535
2	850	702	736	380
3	475	410	740	244
4	273	207	226	100
5	.....	.....	.....	86
6	60	51	52	27
7	61	43	47	25
8	.....	.....	100	16
9	.....	.....	110	23
F.1	224	200	160	96
2	175	143	121	72
3	59	60	62	35
4	350	265	317	154
5	58	49	55	33
6	59	51	55	29
7	62	57	65	33
8	98	73	105	55
9	70	73	67	43
10	60	52	52	30
11	55	52	56	31
12	83	59	87	50
13	.....	.....	.....	.....
14	270	240	250	141
15	90	75	75	40
16	474	350	384	204
17	80	83	73	39
18	76	70	92	39
19	47	44	35	23
20	198	154	220	97
21	435	365	353	230
22	206	172	178	110

Additional measurements of the holotype are: second gill-slit longest, 89 mm.; eye to first gill-opening, 173; tip of snout to outer angle of nostril, 74; inner angle of nostril to mouth, 52; middle of vent to end of tail, 712, and thus in posterior half of shark. First dorsal nearer pectorals than ventrals. Second dorsal smaller than anal, anal base beginning and ending before and behind origin and end of second dorsal base. Anal margin excised. Pectoral angle reaching below origin of first dorsal. Upper caudal lobe slightly longer than head, pointed; lower lobe rather pointed.

Colour bronze-greyish above, white below, a broad lateral bronze band along side. Fins with more or less dusky edges and tips; black blotch at end of second dorsal and lower caudal lobe. Dark upper tone reaching middle of eye anteriorly and top of eye posteriorly.

Liver dark grey, 1 lb. 1 oz. equals 3.2 per cent. total body weight. Stomach contained fish bait. Spiral valve of the scroll type, with five turns.

Mesovarium or epigonal organ not ovulating, fatty. Left uterus with two embryos, in separate compartments each with pseudo-placenta. Margin of their dorsals white with inframarginal dark streak.

Total lengths, 345 mm., 7½ oz., foetotype 1; 340 mm., 7 oz., foetotype 2.

Right uterus similarly had two embryos: total lengths, 336 mm., 7 oz., foetotype 3 (Fig. 2); 355 mm., 8 oz., foetotype 4.

Described and figured (Fig. 1) from the holotype, a gravid female 1,545 mm. in total length and 55 lbs. in weight.

Loc. Van Cloon Reef, Joseph Bonaparte Gulf, W.A.; Australian Museum regd. no. IB. 2421; caught on hook and line at surface by Mr. K. Godfrey, September 15, 1949. *Stanley Fowler* cruise.

VARIATION IN PARATYPES

Paratype A. Female. Length, 1,265 mm.; weight, 30 lbs. Same data as holotype. Similar but has head 3.7 in total length, fourth gill-slit longest and second dorsal further forward in relation to anal. Pectoral angle reaches well below first dorsal and it is a dumper shark generally. Eye to first gill-opening, 155 mm.; tip of snout to outer angle of nostril, 67; inner angle of nostril to mouth, 42.

$$\begin{array}{r} \text{Dental formula } 14.1.14 \\ \hline 13.1.14 = \frac{29}{28} \end{array}$$

Liver, 12 ozs., or 2.5 per cent. total weight. Caught on half a tuna used as bait, swallowed whole. One small embryo in each uterus, both male, 75 mm. long, between 1½ and 2 oz.

Paratype B. Male. Length, 1,230 mm., weight 23½ lbs. Bathurst Island, September 5, 1949; Mr. A. J. Mandell. As in holotype, but dental formula

$$\begin{array}{r} 15.1.16 \\ \hline 14.1.1.15 = \frac{32}{31} \end{array}$$

Origins and end of second dorsal in advance of those of anal, pectoral angle just beyond level of first dorsal origin. Claspers 110 mm.—not fully mature male. Bronze-coloured with black tips to both dorsals, pectorals and lower caudal lobe. Stomach contained digested fish remains. Liver weight, ¾ lb., thus 3.1 per cent. total weight.

Paratype C. Male. Length 1,400 mm., weight 41 lbs. Peron Island, Northern Territory, September 25. Head 3.7 in total length, pectoral angle barely reaches origin of first dorsal. Pupil a vertical slit. General colour greenish without stripe along sides. No interdorsal ridge. Liver weight 1 lb. 6 ozs. or 3.3 per cent. whole body weight. Stomach contained two fish hooks and a fish (*Lethrinus fletus*) bitten once. Dental formula

$$\begin{array}{r} 13.1.13 \\ \hline 13.1.13 = \frac{27}{27} \end{array}$$

Jaws in possession of Mr. A. J. Mandell. Mesorehnum stretching for length of oelome; vesiculae seminales empty.



Fig. 2—Female embryo, 336 mm. long, from holotype of *Tilston's Shark*.

Paratype D. Immature male. Length 765 mm., weight 5 lbs. 6 ozs. Port Essington, October 2, 1949. Head 193 mm.; interdorsal, 162; upper caudal lobe, 212; claspers 18 mm. Liver 3 oz. or 3.48 per cent, total weight. Stomach empty.

Paratype E. Immature female. Length 740 mm., weight 4½ lbs. Port Essington, October 2, 1949. No umbilical scar. Head, 190; interdorsal 151. upper caudal lobe, 212. Liver, 2 oz., or 2.7 per cent, whole weight. Stomach empty.

Paratype F. Immature male. Length 765 mm., weight 5 lbs. 2 ozs. Lyncdoch Bank, October 5, 1949. Biometrical measurements, vide supra. Endolymphatic openings conspicuous. No umbilical scar. Has very dark fins. Dental formula 14.1.14 $\frac{29}{25}$. Liver 3½ ozs., 3.9 per cent, total weight.

$$\frac{12.1.12}{25}$$

General colour very dark grey, no conspicuous lateral stripe. All fins almost black. Mesorchium length of coelome. Stomach empty.

Paratypes G-K. Evans Shoal, October 6, 1949, as below. Coloration light. No umbilical scars. Paratype G had probably bred, the mesovarium being dormant; no embryos. Specimen K had three embryos, a male of 156 mm., female 150, and male 160. No ova. Stomach of H had head of large fish. others empty.

Para-type	Total Length mm.	W'ght lb.	H2. mm.	F4. mm.	Sex	Upper caudal lobe mm.	Liver wt. and whole wt.	Dental Formula
G.	1,500	60	380	334	Female	390	2 lb. 3 oz. equals 3.6%	14.2.15
H.	1,365	39	343	305	Male; claspers 115/126 mm.	350	2 lbs. equals 5.1%	14.1.13 14.1.15 13.1.12
I.	1,466	50	380	330	Female	360	3½ lbs. equals 6.5%	14.1.13 13.1.11? (damaged)
J.	1,395	42	350	343	Male; claspers 114/126	355	1 lb. 11 oz. equals 4.01%	13.0.13 12.1.13
K.	1,498	68	400	380	Female	382	8 lb. 8 oz. equals 12.5%	.....

Paratypes L-Q. From Flinders Reef, Timor Sea, October 6, 1949.

Para-type	Total Length mm.	W'ght lb.	H.2 mm.	F.4 mm.	Sex	Upper caudal lobe mm.	Liver wt. and whole wt.	% wt.	Remarks
L.	935	11	240	211	Female	265	3 ozs. = 1.7 %		Dark colour. Immature.
M.	1,125	19	280	250	Female	330	1lb. 1oz.	5.5%	Dark. Immature.
N.	1,405	40	353	330	Male; claspers 113/121 mm.	360	2lb. 9oz.	6.4%	Fairly dark; not fully mature.
O.	1,195	26+	305	276	Male; 104/110	315	Damaged		Fairly dark; little milt.
P.	1,340	36	327	314	Male; 118/124	355	2lb. 4oz.	6.2%	Fairly dark; little milt.
Q.	1,360+	47	354	339	Male; 117/125	300+ (damaged)	3lb. 6oz.	7.1%	Lighter colour. Stomach contents digested. No milt.

The liver weight of this shark is usually about 3-3½ per cent. of the whole weight, but paratype L was only 1.7 per cent, and the large paratype K was 12½ per cent. Values for paratypes H, I, J, K, M, N, P and Q were higher than usual; I can offer no explanation for this.

Paratype R. Immature female, length 1,003 mm., weight 15½ lbs. Wessel Island, Northern Territory, October 18, 1949. Head, 243 mm.; interdorsal, 227; upper caudal lobe, 303. General colour bluish. Liver 8 oz., or 3.2 per cent. whole weight. No umbilical scar. No ova or embryos. Fish bait in stomach.

Range: North-western Australia to Northern Territory, generally over reefs and shoals. Exceeds five feet in length. Might attack man.

Named in honour of Assistant Surgeon Tilston, naturalist at the old settlement (long abandoned) at Port Essington, Northern Territory (J. MacGillivray, *Narr. Voy. Rattlesnake*, i, 1852, pp. 156 and 159.)

Affinities: Study of whaler sharks in the field, from series of fresh specimens shows that certain criteria used hitherto in separating species (such as relative positions of second dorsal and anal fins, proportions, etc.) do not always hold for all specimens. Bigelow & Schroeder (*Mem. Sears Found. Mar. Res.*, vol. i, 1948, p. 320) state that distinguishing features for whaler sharks are "characters so precise and so little variable that specific identification is not difficult although attention to detail is required." In their key the fresh-water shark, *Carcharhinus nicaraguensis* comes closest to my new one in characters but, of course, the Australian one differs in form of nostrils, teeth and second dorsal fin. As already noted, the new subspecies differs from *Galeolamna greyi* in having a more pointed snout and more deeply notched teeth. *G. greyi mckaili* Whitley is a rounder shark generally with blunt snout and differently outlined teeth. The new subspecies differs from *G. greyi cauta* Whitley in having the pectoral angle reaching below or beyond the level of the first dorsal origin, whereas in *cauta* it is well before same, and the teeth are typically fewer. In all respects the new shark comes closest to Bleeker's *pleurotaenia* (a good name for it, referring to the dark lateral stripe, present in most examples), but it differs in having finely serrated sides to the slightly spatulate cusps of the teeth in the lower jaw. Bleeker stated, "Dentes supramaxillares denticulati, inframaxillares graecillimi non denticulati" and the smooth lower teeth are shown in his figure. From all other species it is distinguished by the lack of an interdorsal ridge, form of nostrils and teeth, proportions, etc., as detailed above.